UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,292	04/02/2004	Henrik Lund	10444.500-US	2299

25908 7590 03/30/2006

NOVOZYMES NORTH AMERICA, INC.
500 FIFTH AVENUE
SUITE 1600
NEW YORK, NY 10110

EXAMINER	
KOSSON, ROSANNE	

ART UNIT	PAPER NUMBER
1653	

DATE MAILED: 03/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/817,292	LUND ET AL.	
	Examiner	Art Unit	
	Rosanne Kosson	1653	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

The amendment filed on March 13, 2006 has been received and entered. Claims 1 and 10-12 have been amended. Claims 15 and 16 have been canceled, and no claims have been added. Accordingly, claims 1-14 are examined on the merits herewith.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Election/Restrictions

In the previous Office action, Applicants' election of Group II, claims 1-14, drawn to a method of treating paper making pulp comprising the steps of alkaline treatment, followed by pectate lyase treatment, was acknowledged, and it was made clear that the remaining inventions were withdrawn from prosecution. In their Response, although not arguing the restriction requirement, Applicants have argued that most of the non-elected inventions are patentable over the prior art- Groups I and III-VI. To reiterate, these inventions are withdrawn from prosecution and will not be considered in the instant case. Therefore, this Office action pertains to the elected invention only, and the claims are examined to the extent that they read on the elected invention only. If Applicants wish to have their non-elected inventions considered, they may file divisional applications. The finality of the restriction requirement has not changed.

Claim Rejections - 35 USC § 112, second paragraph

In view of Applicants' amendments to claims 10 and 11, this rejection is withdrawn.

Claims 1-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as

the invention. The claims have been amended to recite a method for reducing the cationic demand and/or the content of anionic trash in a paper making wood pulp, but the method comprises at least two steps- alkaline treatment of the pulp and pectate lyase treatment of the pulp. The alkaline treatment step produces anionic polygalacturonic acid, which increases the amount of anionic trash/cationic demand (see p. 1 of the specification, background section). The second step decreases the amount of anionic trash/cationic demand. The method as claimed is confusing, as these two steps appear to create a contradiction, rendering the meaning of the claims unclear. Appropriate correction is required.

Claim Rejections - 35 USC § 102

Claims 1-7, 10, 12 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanabe et al. ("On mechanism of enzymic maceration of bast fibers. II. Approach from aspect of fiber components," Shikoku Kogyo Gijutsu Shikensho Kenkyu Hokoku 15:63-88, 1988) with evidence provided by IUBMB Enzyme Nomenclature (Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (NC-IUBMB), Web Version of Enzyme Nomenclature, record for pectate lyase, EC 4.2.2.2, http://www.chem.qmul.ac.uk/iubmb/enzyme/EC4/2/2/2.html, printed on August 29, 2005, "Enzyme Nomenclature") and Plants for a Future (database search results for *Edgeworthia papyrifera*, http://www.ibiblio.org/pfaf/cgi-bin/arr_html?Edgeworthia+papyrifera&CAN=COMIND, 1997-2000). The rejection for anticipation by Tanabe et al. as evidenced by Enzyme Nomenclature was discussed in the previous Office action.

Applicants assert that the claims are not anticipated because they have been amended to recite a method for reducing the cationic demand and/or the content of anionic trash in a paper making wood pulp, and Tanabe et al. disclose the treatment of bast fibers, which are not a wood pulp. They refer to the sentence bridging pp. 72-73.

In reply, this sentence talks about aggregates of lignin with pectic substance in woods and nonwoods including bast fibers. It is not clear from this sentence which category the authors consider bast fibers to be in. But, the source of the bast fibers, from which paper is made, is the plant *Edgeworthia papyrifera*, also known as paper birch or paperbush. Plants for a Future discloses that this plant is a shrub (see p. 1, Physical Characteristics) (trees and shrubs have woody trunks and branches), that high-class paper is made from the bark (see p. 2, Other Uses), and that cuttings may be made from the half-ripe wood (see p. 3, Propagation). Thus, Plants for a Future discloses that this pulp material from which paper is made is a wood pulp. In view of the foregoing, the rejection of record is maintained.

Claims 1-7, 10, 12 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Kobayashi et al. ("Approach to maceration mechanism in enzymatic pulping of bast fibers by alkalophilic pectionlytic enzymes produced by *Erwinia* species," Biotechnology Advances, (6):29-37, 1988), with evidence provided by Plants for a Future (database search results for *Edgeworthia papyrifera*, http://www.ibiblio.org/pfaf/cgi-bin/arr_html? Edgeworthia+ papyrifera &CAN=COMIND, 1997-2000). The rejection for anticipation by Kobayashi et al. was discussed in the previous Office action. Applicants traverse the rejection, as the claims have been amended to recite a method for reducing the cationic demand and/or the content of anionic trash in a paper making wood pulp, asserting that bast fiber pulp is not a wood pulp.

In reply, similarly to the foregoing rejection, the source of the bast fibers, from which paper is made, is the plant *Edgeworthia papyrifera*, also known as paper birch or paperbush. Plants for a Future discloses that this plant is a shrub (see p. 1, Physical Characteristics) (trees and shrubs have woody trunks and branches), that high-class paper is made from the bark (see p. 2, Other Uses), and that cuttings may be made from the half-ripe wood (see p. 3,

Propagation). Thus, Plants for a Future discloses that this pulp material from which paper is made is a wood pulp. In view of the foregoing, the rejection of record is maintained.

Claim Rejections - 35 USC § 103

Claims 1-4, 6-10 and 12-14 again rejected under 35 U.S.C. 103(a) as being unpatentable over Andersen et al. (US 6,284,524) in view of Thornton ("Enzymatic degradation of polygalacturonic acids released from mechanical pulp during peroxide bleaching," Tappi Journal 77(3):161-167, 1994) and IUBMB Enzyme Nomenclature (Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (NC-IUBMB), Web Version of Enzyme Nomenclature, record for pectate lyase, EC 4.2.2.2, http://www.chem.qmul.ac.uk/iubmb/enzyme/EC4/2/2/2.html, printed on August 29, 2005, "Enzyme Nomenclature"). The obviousness rejection over Andersen et al. in view of Thornton was discussed in the previous Office action.

Applicants traverse the rejection asserting that Thornton is directed to a different process with a different product and that one of ordinary skill in the art would not be motivated to use a pectate lyase to reduce cationic demand and/or the content of anionic trash in paper-making wood pulp because it is the enzymatic product galacturonic acid that accounts for the reduction of anionic trash. Applicants also assert that, because Andersen et al. teach the pectate lyase digestion of cellulose fibers in industries other than the paper making industry, one of ordinary skill in the art would not be motivated to use pectate lyase in the method of Thornton, as it is the enzymatic product galacturonic acid that accounts for the reduction of anionic trash.

All of Applicants' arguments have been considered, but they are not persuasive. As previously discussed, Applicants' claimed method is the method of Thornton in which pectinase is replaced with a different enzyme, pectate lyase. Both are paper making processes and both have the same products- polygalacturonic acid is digested to galacturonic acid and paper is

made. Thus, these are not different methods with different products. Thornton teaches that the alkaline bleaching step in the paper making process produces polygalacturonic acid from the pectin in wood pulp (pectin being a polymer of α-D-galacturonic acid units), which is known in that industry as anionic trash. The higher the amount of anionic trash, the larger the cationic demand (demand for cationic components to react with and remove the anionic trash). Thus, a method of decreasing the amount of anionic trash is a method of decreasing the cationic demand. A method of decreasing the amount of polygalacturonic acid, by digesting it with an enzyme to produce galacturonic acid, is a method of decreasing the amount of anionic trash and a method of decreasing the cationic demand. Thornton teaches that pectinase is effective for this purpose when it is added to crude TMP, which is a mixture containing many molecules including polygalacturonic acid, because the enzyme digests the polygalacturonic acid, i.e., anionic polymers of galacturonic acid.

As also previously discussed, Andersen et al. teach that TMP (mechanical paper-making pulp) may be treated with pectate lyase to degrade it (see col. 3, lines 21-30, col. 14, lines 34-39, and claims 4-5) and that other enzymes, such as pectinase, may be combined with pectate lyase in this degradation step (see col. 14, lines 22-25, and col. 16, lines 52-67). When TMP is enzymatically degraded, more galacturonic acid is produced from the pectin, or from its break-down products produced by the alkaline bleaching step, as TMP is a crude mixture of many molecules including polygalacturonic acid, thereby reducing the amount of anionic trash and cationic demand. Thus, Thornton teaches that TMP may be degraded with pectinase, and Andersen et al. teach that TMP may be degraded with pectate lyase. Because TMP is a substrate for either enzyme, the prior art teaches one of ordinary skill in the art to use either of these enzymes or both of them together to digest TMP. Thus, one of ordinary skill in the art would be motivated to use pectate lyase to digest TMP because Andersen et al. teach that this

enzyme is effective for this purpose, even though the reference discloses that pectate lyase may be used in industrial processes in several fields. That pectate lyase may be used in several industries does not detract from its applicability as an alternative enzyme in the method of Thornton. The claimed method comprises two steps- alkaline treatment of wood pulp followed pectate lyase treatment of wood pulp. The combination of the teachings of the prior art- Thornton and Andersen et al.- clearly suggests this method, while, as discussed above, Tanabe et al. and Kobayashi et al. anticipate this method.

Additionally, Enzyme Nomenclature discloses that pectin is the methyl ester of pectate and that pectate, the anionic form, is the preferred substrate of pectate lyase (compared to pectin, which is preferably hydrolyzed by pectin lyase) (see comments on p. 1 and the diagram on the last page). The alkaline conditions of the TMP bleaching process favor the conversion of pectin to pectate (basic hydrolysis of an ester), making it a good substrate for pectate lyase. Thus, it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to use pectate lyase in the method of Thornton, because Enzyme Nomenclature teaches that pectate lyase digests anionic polymers of galacturonic acid, which is what polygalacturonic acid is. As a result, one of ordinary skill in the art would have reasonably expected the TMP degradation step of Andersen et al., pectate lyase degradation, to work in anionic trash/cationic demand reduction method of Thornton. Andersen et al. do not explicitly disclose that treating TMP with pectate lyase promotes the break down of polygalacturonic acid. But, as discussed above, the pectate lyase of digestion of anionic polygalacturonic acid is taught by Enzyme Nomenclature.

The rejection of record is therefore maintained.

Claim 5 is again rejected under 35 U.S.C. 103(a) as being unpatentable over Andersen et al. (US 6,284,524) in view of Thornton ("Enzymatic degradation of polygalacturonic acids released from mechanical pulp during peroxide bleaching," Tappi Journal 77(3):161-167, 1994) and of IUBMB Enzyme Nomenclature (Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (NC-IUBMB), Web Version of Enzyme Nomenclature, record for pectate lyase, EC 4.2.2.2, http://www.chem.qmul.ac.uk/ iubmb/enzyme/EC4/2/2/2.html, printed on August 29, 2005, "Enzyme Nomenclature"). This rejection was discussed in the previous Office action.

In the previous Office action, the rejection also named, but did not discuss, Back et al. (US 5,582,681). Back et al. pertain to claim 11, as discussed below, not to claim 5. Therefore, this reference has been removed from the rejection.

Applicants traverse the rejection, asserting that one of ordinary skill in the art would not be motivated to use pectate lyase in the method of Thornton for the reasons given above and that Enzyme Nomenclature does not teach using pectate lyase in a method of treating paper making wood pulp.

In reply, the motivation to combine the teachings of Andersen et al. and Thornton is provided above in the foregoing rejection. To reiterate, Andersen et al. teach that TMP may be treated with pectate lyase to degrade it (see col. 3, lines 21-30, col. 14, lines 34-39, and claims 4-5) and that other enzymes, such as pectinase, may be combined with pectate lyase in this degradation step (see col. 14, lines 22-25, and col. 16, lines 52-67). When TMP is enzymatically degraded, more galacturonic acid is produced from the pectin, or from its break-down products produced by the alkaline bleaching step, as TMP is a crude mixture of many molecules including polygalacturonic acid, thereby reducing the amount of anionic trash and cationic demand. Thus, Thornton teaches that TMP may be degraded with pectinase, and

Andersen et al. teach that TMP may be degraded with pectate lyase. Because TMP is a substrate for either enzyme, the prior art teaches one of ordinary skill in the art to use either of these enzymes or both of them together to digest TMP. Thus, one of ordinary skill in the art would be motivated to use pectate lyase to digest TMP because Andersen et al. teach that this enzyme is effective for this purpose, even though the reference discloses that pectate lyase may be used in industrial processes in several fields. That pectate lyase may be used in several industries does not detract from its applicability as an alternative enzyme in the method of Thornton. The claimed method comprises two steps- alkaline treatment of wood pulp followed pectate lyase treatment of wood pulp. The combination of the teachings of the prior art- Thornton and Andersen et al.- clearly suggests this method, while, as discussed above, Tanabe et al. and Kobayashi et al. anticipate this method.

Additionally, Enzyme Nomenclature discloses that pectin is the methyl ester of pectate and that pectate, the anionic form, is the preferred substrate of pectate lyase (compared to pectin, which is preferably hydrolyzed by pectin lyase) (see comments on p. 1 and the diagram on the last page). The alkaline conditions of the TMP bleaching process favor the conversion of pectin to pectate (basic hydrolysis of an ester), making it a good substrate for pectate lyase. Thus, it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to use pectate lyase in the method of Thornton, because Enzyme Nomenclature teaches that pectate lyase digests anionic polymers of galacturonic acid, which is what polygalacturonic acid is. As a result, one of ordinary skill in the art would have reasonably expected the TMP degradation step of Andersen et al., pectate lyase degradation, to work in anionic trash/cationic demand reduction method of Thornton. Andersen et al. do not explicitly disclose that treating TMP with pectate lyase promotes the break down of polygalacturonic acid.

But, as discussed above, the pectate lyase of digestion of anionic polygalacturonic acid is taught by Enzyme Nomenclature.

Enzyme Nomenclature does not discuss making paper from wood pulp. But, it is clear in the previous Office action that this reference was not cited for discussing the paper making process but for its teaching that pectate lyase digests galacturonic acid polymers and produces unsaturated oligomers with a 4,5 carbon-carbon double bond in the non-reducing terminal sugar residue.

Therefore, the rejection of record is maintained.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Andersen et al. (US 6,284,524) in view of Thornton ("Enzymatic degradation of polygalacturonic acids released from mechanical pulp during peroxide bleaching," Tappi Journal 77(3):161-167, 1994), Back et al. (US 5,582,681) and IUBMB Enzyme Nomenclature (Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (NC-IUBMB), Web Version of Enzyme Nomenclature, record for pectate lyase, EC 4.2.2.2, http://www.chem.qmul.ac.uk/iubmb/enzyme/EC4/2/2/2. html, printed on August 29, 2005, "Enzyme Nomenclature"). The rejection for obviousness over Andersen et al., Thornton and Back et al. was discussed in the previous Office action.

Applicants traverse the rejection, asserting that neither Thornton nor Andersen et al. teach the use of pectate lyase to reduce the amount of anionic trash/cationic demand in a process of making from wood pulp. This point has been addressed multiple times above. Nevertheless, to reiterate, Andersen et al. teach that TMP may be treated with pectate lyase to degrade it (see col. 3, lines 21-30, col. 14, lines 34-39, and claims 4-5) and that other enzymes, such as pectinase, may be combined with pectate lyase in this degradation step (see col. 14, lines 22-25, and col. 16, lines 52-67). When TMP is enzymatically degraded, more galacturonic

acid is produced from the pectin, or from its break-down products produced by the alkaline bleaching step, as TMP is a crude mixture of many molecules including polygalacturonic acid, thereby reducing the amount of anionic trash and cationic demand. The claimed method comprises two steps- alkaline treatment of wood pulp followed pectate lyase treatment of wood pulp. The combination of the teachings of the prior art- Thornton and Andersen et al.- clearly suggests this method, while, as discussed above, Tanabe et al. and Kobayashi et al. anticipate this method.

Additionally, Enzyme Nomenclature discloses that pectin is the methyl ester of pectate and that pectate, the anionic form, is the preferred substrate of pectate lyase (compared to pectin, which is preferably hydrolyzed by pectin lyase) (see comments on p. 1 and the diagram on the last page). The alkaline conditions of the TMP bleaching process favor the conversion of pectin to pectate (basic hydrolysis of an ester), making it a good substrate for pectate lyase. Thus, it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to use pectate lyase in the method of Thornton, because Enzyme Nomenclature teaches that pectate lyase digests anionic polymers of galacturonic acid, which is what polygalacturonic acid is. As a result, one of ordinary skill in the art would have reasonably expected the TMP degradation step of Andersen et al., pectate lyase degradation, to work in anionic trash/cationic demand reduction method of Thornton. Andersen et al. do not explicitly disclose that treating TMP with pectate lyase promotes the break down of polygalacturonic acid. But, as discussed above, the pectate lyase of digestion of anionic polygalacturonic acid is taught by Enzyme Nomenclature.

In view of the foregoing, the rejection of record is maintained.

Double Patenting- Obviousness Type

Claims 1-14 are again rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-5 of U.S. Patent No. 6,284,524 (Andersen et al., "Andersen et al. I"), or claims 20 and 21 of U.S. Patent No. 6,187,580 (Andersen et al., "Andersen et al. II"), or claims 21, 23 and 24 of U.S. Patent No. 6,399,351 (Bjørnvad et al.) in view of Thornton ("Enzymatic degradation of polygalacturonic acids released from mechanical pulp during peroxide bleaching," Tappi Journal 77(3):161-167, 1994). This rejection is discussed in the previous Office action.

Applicants traverse each of these rejections on the grounds that one of ordinary skill in the art would not be motivated to combine the teachings of Andersen et al. I and Thornton. This motivation has been provided above several times. But, as also discussed above, the claimed method comprises two steps- alkaline treatment of paper making wood pulp (which has been known for many decades) and pectate lyase treatment of paper making wood pulp. This second step is taught and claimed by Andersen et al. I, Andersen et al. II, and Bjørnvad et al., and these rejections are obviousness-type double patenting rejections, not obviousness rejections over the two references (which is above). Therefore, these rejections are maintained.

No claim is allowed.

Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicants are reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rosanne Kosson whose telephone number is 571-272-2923. The examiner can normally be reached on Monday-Friday, 8:30-6:00, with alternate Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jon Weber, can be reached on 571-272-0925. The fax phone number for the organization where this application or proceeding is assigned is 571-272-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rosanne Kosson
Examiner, Art Unit 1653

rk/2006-03-24

Rosanne Kosson

ROBERT A. WAX
PRIMARY EXAMINER